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for Teachers of
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GEOGRAPHY

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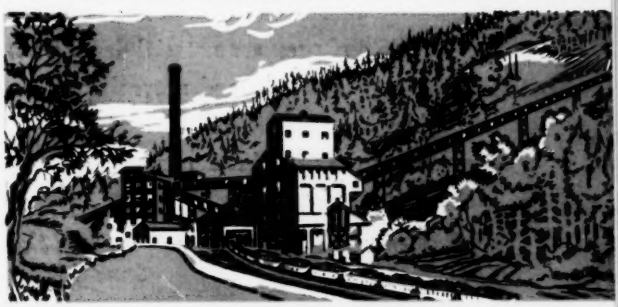

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Dr. Scarfe, Dean of the College of Education, University of Manitoba, is an associate editor of the JOURNAL OF GEOGRAPHY and well known internationally for his many Geography in Education articles which have appeared in several continents. At the time he was Adviser to the UNESCO Seminar held in Canada in 1950, he was head of the Department of Geography, Institute of Education, University of London.

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ZUIDERZEELAND: THE PROVINCE FROM UNDER THE SEA

THOMAS E. MADIGAN
Columbus, Ohio

When the Pilgrims left Holland to sail for the New World, population pressure was one of the factors which already had led the Netherlands[1] to enclose and drain some of the many shallow fresh and salt lakes in the Netherlands. Another factor was the desire of merchants becoming wealthy in the Indies trade to invest their profits in land at home. In 1599, the Zijpe Folder in North Holland was reclaimed and in the next quarter of a century over 130,000 acres were impoldered.

Roman historians record the presence of a number of lakes north of the Rhine River, including the Wieringermeer (Wieringen Lake) and the Flevomeer, a long, narrow, winding lake extending from a point northeast of the present island of Texel to a point near what is now Amsterdam. Changes in the relative levels of land and sea resulted in the encroachments of the sea in storm tides over more and more of the low-lying land until the period of the greatest inundation between 1200 and 1300. By the latter date the Hollanders began to learn more effective methods of controlling the menacing sea.

The earliest method of protection, in use about 400 A.D., seems to have been the building of small hillocks upon which houses and farm buildings were constructed and to which stock could be driven and upon which crops could be stored. In the period from 800 to 1100 A.D., individual farms and then groups of farms were surrounded by dikes to protect them from the storm tides. Another

[1] There is no word in the present day usage of the Netherlands to correspond to our term "Dutch." The correct usage is Netherlander altho Hollander (specifically only an inhabitant of the provinces of North and South Holland) is often used in the everyday language. The insinuations of the phrases "Dutch courage," "Dutch treat" and "Dutch uncle" are resented and properly so.

important step was the impoldering of land lying between the high tide level and the level of low tide. This land was drained by sluice gates which were opened only as the level of the tide fell below that of the water in the polder. Introduction, about 1600, of the now familiar windmill with a revolving head which could be turned to catch each breeze was followed by the successful draining of lands lying below the ebb tide level.

The acreage impoldered in the first quarter of the 17th Century was not to be equaled but once in any succeeding quarter century until the 20th Century. In 1852, the large Haarlem Lake, which had threatened the cities of Haarlem and Amsterdam during storm tides, was reclaimed. In the eastern corner of this lake was a bay called "'t Schiphol" (the ship hole) where many ships had been driven to destruction during westerly gales. In this corner of the polder has been developed one of the world's foremost airports, Amsterdam-Schiphol, lying about 4½ meters (14 feet) below sea level. Do you know of any major airport that is lower than that?

ZUIDER ZEE POLDERS

The work on the Zuider Zee polders, tho projected as far back as the 17th Century, was commenced in 1920 with the construction of a short sea like joining Wieringen Island to the mainland of North Holland (Fig. 1). Following the completion of this dike, work was begun on the sea dike from Wieringen to the coast of Friesland. In the meantime, a small experimental polder at Andijk, North Holland, was completed in 1927. This little polder of only about 100 acres was used to study the best methods of drainage, fertilization, etc., and the best crop successions to use from salt-tolerant crops in the first plantings to higher producing crops as the soil became relatively salt-free.

For a number of reasons the planners had felt that the completion of the enclosing sea dike should precede the draining of the polders by several years: 1. the over 180 miles of sea dikes around the Zuider Zee would be reduced to the 20 miles of enclosing dike exposed to the direct assault of the sea, thus greatly reducing maintenance costs; 2. the dikes of the future polders could be of much simpler, less expensive construction as they would not be subjected to the pounding of high seas; 3. by letting out excess water at low tide thru sluice gates, the waters of the enclosed lake would be maintained at a height below mean sea level, thus facili-

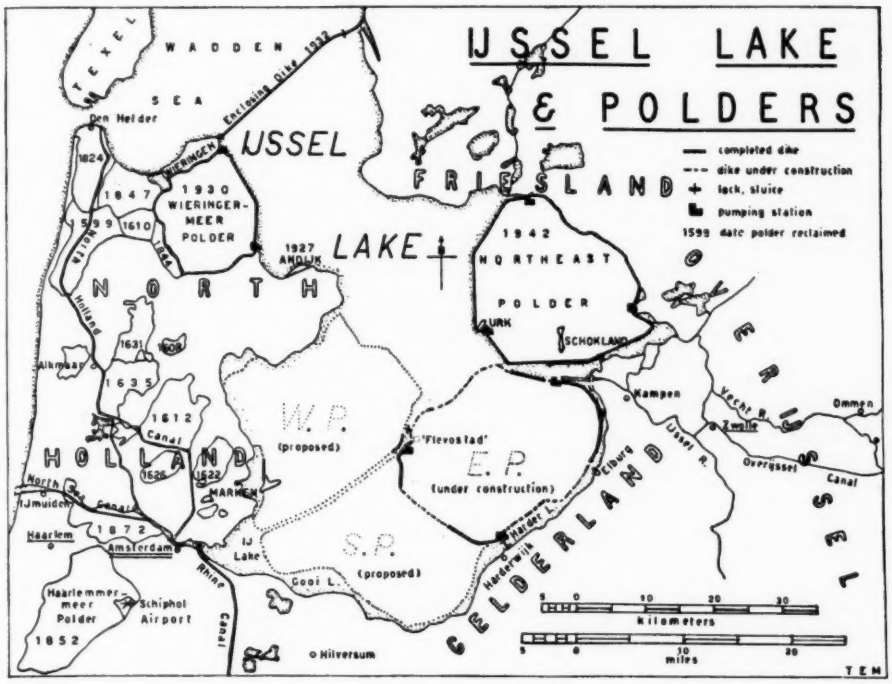

FIG. 1

tating drainage of surrounding lands; 4. the waters of the enclosed IJssel Lake[2] would become fresh thru the dilution by rainwater and the water of the IJssel, the Vecht and other rivers draining into the Lake; 5. the soils would lose slowly much of their salt as the lake water freshened, thus speeding reclamation; 6. the presence of a large body of fresh water adjacent to the coasts of North Holland and Friesland would help counteract the increasing salinity of the ground waters in those provinces; 7. the fresh water of the IJssel Lake could be used for irrigation or infiltration[3] in dry seasons; and 8. land transportation between North Holland and Friesland would be improved by a road over the enclosing dike.

WIERINGERMEER AND NORTHEAST POLDERS

The demand for new arable land was so great that it became necessary to modify the original plans. The first polder, the Wier-

[2] IJsselmeer. In the Netherlandish language the IJ is written as one character. It often takes the place of the Y on the standard typewriter keyboard.

[3] Infiltration. A method of raising the ground water level in dry periods.

ingermeer polder, was enclosed and drained two years before the completion of the main enclosing dike from Wieringen Island to Friesland. Thus the full problem of removing the salt from the soil of this polder had to be solved. By the time of the completion of the dike around the Northeast Polder, the waters of the IJssel Lake had been sweet for some time. A large amount of salt remained in the groundwater beneath the surface of the polder, however. As a result of this, all farms on the polder were equipped with "city water," that is, water piped into the polder from outside sources. The lessons learned on the earlier polders were applied to speed the reclamation of this much larger polder. Because of the protection against storm tides offered by the enclosing dike, the dikes of the Northeast Polder needed to be built to a height of only 14 feet above the level of the IJssel Lake, in contrast to the sea dikes which are built to a height of 25 feet.

TABLE 1

Construction Project	Acreage	Date Dikes Were—		Date Pumping—	
		Begun	Completed	Began	Ended
Enclosing Dike, west	—	1920	1924	—	—
Enclosing Dike, east	—	1927	May, 1932	—	—
Andijk (experimental polder)	100		1927		1927
Wieringermeer Polder	49,000	1926	1929	Jan., 1930	Aug., 1930
Northeast Polder	118,600	1936	Dec., 1940	Dec., 1940	Sept., 1942
East Polder[4]	133,400	June, 1950	[1955?]		[1955–56?]
West Polder	133,400				
South Polder[4]	111,200				

[4] The Southeast Polder is to be developed in two sections as 244,600 acres, was deemed to be too large an area to be handled effectively by the men and machinery available for reclamation at any one time.

Under wartime restrictions the draining of the Northeast Polder was begun with only one of the three pumping stations in operation. A second station became available about four months later, but the third was not in operation until the polder was practically dry. The permanent canals leading to the pumping stations had been dredged before the polder was drained, as the surface of the newly-drained polder was a quaking, jelly-like mass, impossible to traverse. The clays of the sea floor are suspended in a diffuse mass by the surrounding water as anyone who has put a bare foot into the soft ooze of lake or sea bottom will realize. When the water

is drained away, the soil will settle, as much as a meter in some cases. While 75 per cent of this settling takes place in the first 10 years, some soils will hold water up to 100 years. Buildings, therefore, must be erected on piles.

As soon as it was possible to put machines on the polder fields, more secondary canals and boundary ditches were dug with draglines. About 300 meters (990 feet) apart and 800 meters (2640 feet) long, these canals formed the long sides of parcels of land of 24 hectares (about 60 acres). A hard-topped road and a canal form the short ends of the usual parcel. These parcels could be combined or divided in accordance with the proposed plan of land use. While the soil was still too soft to employ a plow in the ordinary manner, two specially designed plows set at opposite sides of a field were attached by cables to a tractor stationed at

Fig. 2. One of several models of "deep plow" which cuts a five foot furrow and requires three heavy duty caterpillar tractors to pull it. (Courtesy of Directie van de Wieringermeer).

the middle of the field. As the two trenching plows were pulled toward the tractor and toward each other they dug drainage ditches 60 centimeters (two feet) deep. These ditches, at intervals of 8 to 35 meters (26 to 119 feet) depending upon the type of soil, after they have served as open drainage ditches for a certain period, had tiles laid in them and were then filled with earth. This gave in each field a full 24 hectares (60 acres) of unobstructed land for use with mechanized farming.

In some areas the drainage tiles were laid perfectly level in order that the same tile could be used for infiltration in dry seasons. Yes, the Netherlands with its Marine West Coast climate has dry spells. During the year that I spent in that charming country (1951-52), there were two extended dry periods, one in the autumn and the other in the spring. These dry periods did not result in the sere, brown grass and hardbaked earth that we are familiar with in many parts of the United States, however. The drought is not as long and the canals and ditches are there to bring water from the rivers and lakes to the land. In the Northeast Polder in areas of fine sand or peat soils or where the surface is especially elevated (i.e., the former island of Scholand and vicinity), the drainage tiles are laid precisely level in order that water may be infiltrated into the soil to maintain ground water at predetermined levels. There are special inlet sluice gates and networks of canals for this purpose. The ground water tables are maintained at a level of about 60 centimeters (two feet) below the level of grassland and about 160 centimeters (5½ feet) below arable land. If the water table drops much below these levels the plants begin to show signs of drought.

In test bores in certain parts of the polder it was found that a surface layer of sand was underlain at a depth of about one meter by a good clay soil. To have trucked away the overlying sand would have been expensive, to say the least. To improve this soil, a rather novel method of "deep plowing" was developed, using specially devised machinery which plows a furrow to depths of 1.5 meters (5 feet). This plow with its single plowshare requires three heavy duty caterpillar tread tractors to pull it.

For drainage purposes the Northeast Polder is divided into an eastern area with the water in the canals standing 4.5 meters (15 feet) below sea level and a western area where the surface of the water in the canals is 7.6 meters (about 19 feet) below sea level. As

a result of lowering the water level adjacent to the old coastline, the ground water table at the edge of the old land dropped seriously, especially where the soil was porous, i.e., fine sand or peat. With the latter, the ground water level fell to more than two meters (6.5 feet) below sea level. Where the soil is of heavy clay the water level did not fall as seriously (Fig. 3). Consequently, the plans for the southern polders were modified to allow for narrow lakes be-

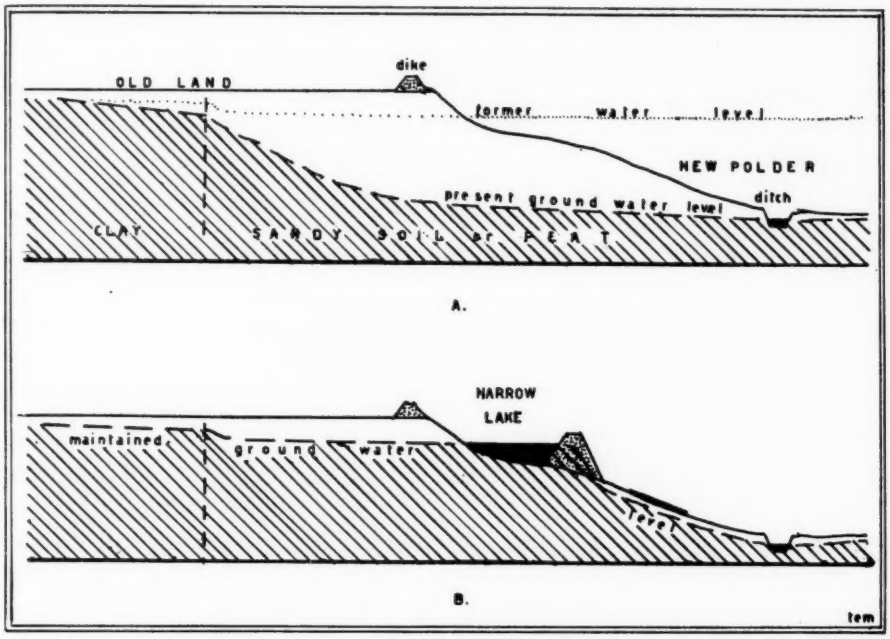

Fig. 3. Diagram A. Ground water table along edge of Northeast Polder. Not to scale. Diagram B. Planned ground water table in southern polders. Lake will be maintained at a level high enough to maintain water tables.

tween the new polders and the old land, varying in widths up to 2600 meters (1.61 miles) off the Gelderland coast (Harder Lake).

East Polder

In June, 1950, work commenced at several places on the dike of the East Polder. The map represents the stage of construction in early 1953 according to word received from the director-engineer. To provide a good footing for the dike, the site is dredged of three to five meters (10 to 17 feet) of mixed muddy material. This area is then filled with sand which is built up to form the core of the

dike. An outer wall of impervious boulder clay, dredged from certain parts of the IJssel Lake, is backed with sand and the whole dike is then surfaced with boulder clay. Woven willow mats held down with stone protect the outer surface up to wave level and stone and brick facing are used above this point. To facilitate work on the dike and to provide for future navigation to Elburg and Harderwijk, a channel of 40 to 70 meters (132 to 231 feet) has been dredged between the site of the dike and the mainland. Temporary construction pits (tiny polders) have been built in which the pumping stations, sluices and locks are being constructed. It is now expected that the East Polder dikes will be completed early in 1955 and that the bulk of the water will be pumped out in eight months after that.

FLEVOSTAD

As the West Polder, lying next to the most densely populated part of the country, had seemed the logical choice for development a start was made in 1941 and about 2.5 kilometers (1.55 miles) of dike was constructed northward from the island of Marken. After the war a sociogeographical study showed that it would be desirable to develop the East Polder next. A principal reason was the proposal to locate there the largest community of the polders, tentatively named Flevostad after the Flevo Lake of Roman times (Fig. 4). The site of the city at the bend at the east end of the central canal (Middenkanaal), at the lock separating the canal from the IJssel Lake and at the largest lock leading to the navigable canals of the polder, would most likely evolve as an important community even had it not been so planned. In order to have immediate access to this site the planned position of the dike from Harderwijk was altered to conform to the trace of the proposed highway. When the Southeast Polder has been completely drained, this former dike will be an elevated highway across the middle of the polder with no intersections at grade. It is planned to carry the highway thru the city of Flevostad at a different grade from the city streets, thus solving one of the major problems of modern city planning while the site of the city is still covered by 10 to 15 feet of water!

Flevostad is planned as a city of about 40,000 inhabitants with the possibility that further industrial development attracted to the site will bring the total to 70,000. Its convenient location for water transportation within and without the polder will be supplemented

by a network of highways. A major highway and railway are proposed from Amsterdam to Lelystad and branching there is Zwolle and, via a one thousand foot bridge, to the Northeast Polder and Groningen. Other roads are to connect the city of the future with Alkmaar, Enkuizen, Hilversum, Harderwijk, Elburg, Zwolle, Kampen and the major towns of the new polders.

A town of three to five thousand people is planned for a site somewhat to the northeast of the centre of East Flevoland about half way between Zwolle and Lelystad. It must be located at a distance from the latter city such that there will be no interference

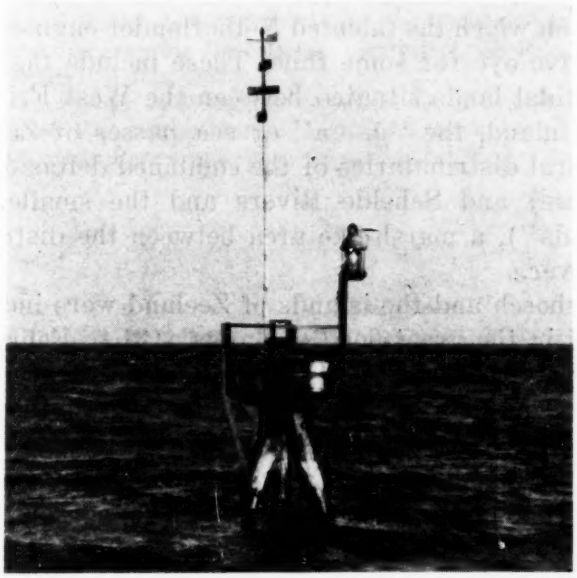

Fig. 4. The site of the future city of "Flevostad," capital-to-be of Zuiderzeeland now covered by 10-15 feet of water in the middle of the IJssel Lake (Courtesy of Directie van de Wieringermeer).

of function between the two communities. Villages with a purely agricultural function are to be spaced about six kilometers (3.7 miles) apart. Some areas in each polder are to be given over to forestry. The narrow lakes bordering the polders are to be landscaped for recreational purposes. Possibly small islands will be established in these lakes.

Zuiderzeeland?

It is proposed by some that the new polders be established as the twelfth province of the Netherlands and be given the name

Zuiderzeeland with Lelystad as the capital. However, there is also sentiment in favor of incorporating the polders into the adjacent provinces. In either case the completion of these polders will increase the arable land of the Netherlands by ten per cent and will provide a livelihood for a quarter of a million people.

POSSIBLE FUTURE PROJECTS

What of the future for a nation with a net annual population increase of one hundred thousand and with over ten million now crowded into slightly over twelve thousand square miles? Has she any further areas to be rescued from the sea? Yes, there are three other areas on which the talented Netherlander engineers have had their collective eye for some time. These include the "waddens" or shallow tidal lands situated between the West Frisian Islands and the mainland, the "gaten" or sea passes of Zeeland which are the several distributaries of the combined deltas of the Rhine, Maas (Meuse) and Schelde Rivers and the smaller Biesbosch ("rush woods"), a marsh-like area between the distributaries of the Maas River.

The Biesbosch and the islands of Zeeland were included in the area flooded in the great flood of January 31 to February 1, 1953 in which about 395,000 acres were flooded and over 580,000 persons were driven from their homes. This flood, of a magnitude calculated to occur only once in over three hundred years, was brought on by an unfortunate coincidence of a normal spring tide following the full moon of January 29 and a prolonged and severe gale with strong northerly winds. The gale grew out of a low which developed off Iceland and which moved across Scotland and the North Sea. It developed a steep gradient on its west side with consequent strong winds which piled the waters of the North Sea against the dikes of the Low Countries. High water was nine feet more than expected and broke records at most stations by two feet. As a consequence of this storm the plans for diking the sea "gaten" of Zeeland are to be accelerated.

The reclaimed lands will not absorb all of the population increase of the Netherlands, nor is emigration the ultimate answer. Some of the areas in which geographers and other scientists have sought the answer or answers include: maximal use of natural resources, improvement of domesticated breeds of animals and plants and domestication of others that could be used by man, soilless

plant culture, less meat and more vegetables in the diet, population control, outlawing of waste (and especially the waste of war, tragic fratricide that it is) and many other areas. Perhaps the ultimate answers are included in this list, perhaps they have yet to be found; once found or determined, they must be applied.

* * *

Credits

Dienst der Zuiderseewerken and Chief Engineer-Director J. F. R. Van de Wall for pamphlets and personal communications.

Directie van de Wieringermeer (Noortoostpolderwerken) and Mijnheer W. M. Otten for photographs, pamphlets, letters and oral communications.

W. M. Otten and J. F. R. Van de Wall for articles in the Tijdschrift van het Koninklijk Nederlandsch Aardrijkskundig Genootschap (Journal of the Royal Netherlandish Geographic Society) for July, 1952.

Het Ministerie van Verkeer en Waterstaat for maps, list of geographical names and other information appearing in the Driemaandelijks bericht betreffende de Zuiderzeewerken (Quarterly Report concerning the Zuider Zee Works) for 1951 and 1952.

TESTING GEOGRAPHY OBJECTIVELY

N. V. Scarfe
University of Manitoba

The geographic artifact tests which follow were worked out by graduate students in the Faculty of Education, University of Manitoba, Winnipeg, as part of a term paper associated with my course on the "Teaching of Geography." The tests are self-explanatory, but it is important to state that they have not been properly validated, nor has it been possible to discover at which age level they are best applied. There is also some doubt whether pupils should be provided with the explanation given at the top of each test. Some think that pupils should be asked simply to "underline the geographic articles."

These tests are printed here mainly with the hope that teachers in the United States and Canada will cooperate by applying the tests to various grade levels both with and without the explanatory material at the head of each test. In particular, I am anxious to secure the results of the tests wherever applied, and also to receive any *comments which would help improve the tests* in any way.

GEOGRAPHY TEST A

Name or Initials .....Age: Years .....Months .....

Grade .....

Check: Boy .....Girl .....

This test concerns the influence geographic conditions have upon our civilization. You are asked to underline the one article in each group of four which is *geographic*—that is, the one which is designed to suit certain geographic conditions and will therefore not necessarily suit other regions where conditions are different.

example: necktie, cuff links, earmuffs, belt

"earmuffs" is underlined because they are found only in countries which have a cold winter. The other three articles are not designed to suit any geographic conditions and might be found anywhere.

In answering the following, it might help if you asked yourself the following question in regard to each name:

"In places where it is used, is it designed to suit certain geographic conditions?"

1. dresses, blouses, fur-lined coats, skirts
2. sheepskin gloves, rubber gloves, evening gloves, golfing gloves
3. riding boots, oxfords, dancing slippers, overshoes
4. ties, long underwear, trousers, shirts
5. gasoline, car wax, antifreeze, oil
6. ski pants, running shorts, diapers, evening dress
7. sports coat, jacket, topcoat, parka
8. running shoes, brogues, cowboy boots, bedroom slippers
9. baseball bat, tennis racquet, ping pong ball, hockey stick
10. dress shirts, T-shirts, flannel shirts, striped shirts
11. car heater, windshield wiper, parking lights, rubber tires
12. nylon stockings, silk stockings, rayon stockings, woolen stockings
13. curling rocks, rubber balls, marbles, tennis balls
14. attics, verandahs, basements, sheds
15. canes, umbrellas, crutches, purses
16. iron railings, door mats, Venetian blinds, storm windows
17. plaster walls, home insulation, screen windows, wooden shingles
18. humidifiers, radios, cooking stoves, television sets
19. eye glasses, telescopes, snow glasses, opera glasses
20. roads, dikes, fences, sidewalks
21. toasters, Silex coffee stands, electric irons, furnaces
22. cod liver oil, aspirin, cough drops, castor oil
23. wagon, baby carriage, sleigh, toy car
24. mattress covers, eiderdown comforters, sheets, pillows
25. wire fences, board fences, iron fences, snow fences
26. police hat, baseball cap, sombrero, wedge cap
27. leather shoes, wooden shoes, slippers, neolite shoes
28. foghorn, auto horn, siren, bicycle bell
29. colored roofs, peaked roofs, flat roofs, domed roofs
30. butcher knife, machete, dagger, sword
31. gramophone, saxophone, harmonica, Alpine horn

32. plantation, vegetable garden, house plants, window-boxes
33. tents, igloos, foxholes, dugouts
34. ditch, shadoof, fence, pump
35. stucco buildings, wooden houses, frame buildings, thatched huts
36. stone buildings, brick buildings, paper buildings, wooden buildings
37. tractors, combines, shovels, scythes
38. grain elevators, machine shops, houses, stores
39. radio stations, windmills, railroads, filling stations
40. station wagons, snowmobiles, jeeps, trucks
41. electric light, candle, flashlight, blubber lamps
42. railway tunnels, railway crossings, railway sidings, railway offices
43. pulp mills, newspaper stands, printing offices, book stores
44. fountains, canals, water taps, sinks
45. iodine, mercurochrome, alka seltzer, quinine
46. paved roads, corduroy (log) roads, race tracks, asphalt roads
47. water reservoirs, pipe lines, soda fountains, bottled drinks
48. radio aerials, sundials, lightning rods, barometers
49. single beds, twin beds, spring mattresses, sleeping bags
50. parachute towers, fire towers, telephone lines, clothes lines

GEOGRAPHY TEST B

Name or Initials ..... Age: Years .....Months .....

Grade: .....

Check: Boy .....Girls .....

This test concerns the influence geographic conditions have upon our civilization. You are asked to underline all the articles which are *geographic*, that is, those which are designed to suit certain geographic conditions and will therefore not necessarily suit other regions where conditions are different.

example: "earmuffs" would be underlined because they are designed to keep the ears warm in cold climates.

In answering the following, it might help if you asked yourself the following question in regard to each name:

"In places where it is used, is it designed to suit certain geographic conditions?"

topcoat	overshoes	cowboy boots	fur-lined coats
skirts	sombrero	ski pants	brogues
striped shirts	silk stockings	flannel shirts	spring mattresses
rubber balls	eye glasses	umbrellas	basements
dikes	iron fences	railway crossings	sleigh
pulp mills	rubber tires	cooking stoves	curduroy (log) roads
water reservoirs	quinine	crutches	cough drops
blubber lamps	furnaces	Alpine horn	riding boots
castor oil	sidewalks	car heater	grain elevator
woolen stockings	evening gloves	curling rocks	fountains
storm windows	telescopes	television sets	kyak
snow glasses	machete	car wax	foghorn
running shorts	igloos	blouses	sleeping bags

dress shirts	eiderdown comforters	slippers	cod liver oil
paper buildings	thatched huts	baseball cap	house plant jars
tractors	sheds	wooden shoes	flat roofs
iron railings	windmills	shovels	canals
trucks	railway tunnels	barometers	alka seltzer
radio stations	long underwear	auto horn	foxholes
leather shoes	single beds	pipe lines	snowmobiles
flashlights	lightning rods	sundials	shadoof
station wagons	antifreeze	filling stations	humidifiers
printing offices	parkas	sheepskin gloves	siren
home insulation	hockey stick	snowfences	stone buildings
railway offices	machine shops	fire towers	combines

Teacher's Guide to the Geographic Artifact Tests

These tests should be administered not less than a week apart in order to avoid a carry-over of knowledge to the second test, which is more difficult than the first.

The students should be warned that in Test B there are exactly fifty geographic articles, and marks will be deducted for underlining more than that number.

Some students will not know the meaning of some of the words. This is expected, and the student is to be directed either to guess or to leave it out. Assistance by the teacher will give a false picture in the results.

Marking. In both tests percentages should be reached by counting the number of CORRECT answers.

In Test B a half mark should be deducted from the total for each article over fifty which is underlined.

ON THE TEACHING OF GEOGRAPHY AND HISTORY

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The double course in world geography and world history at our school is good. It gives us a two-way approach to world problems and conditions of today. Our over-all objective is to at least be aware of the existence of the main human problems of this century and to do what we can to understand their genesis, development and present state of solution.

The approach via world geography attempts to identify the

natural assets and liabilities with which people in a given place must cope in attempting to solve their problems. The natural resources of a people (or their lack of them) and the various aspects of their location are among the basic ingredients which variously blended give strength or weakness to nations in the modern world. One cannot begin an adequate appraisal of people and their problems without a knowledge and understanding of such factors. The emphasis in this course is essentially upon the present.

The approach via world history attempts to attack the great problems of today by studying their genesis and evolution in time. Whereas the central theme in geography is place and the characteristics of place; time and continuity, along with the principle of cause and effect are central in historical analysis. The emphasis in world history is essentially upon the past.

Which approach gives the more adequate understanding and the better means for probing the social problems of today—that of world geography or world history? Which is more important—the current natural assets and liabilities of a people's habitat or their record of development to their present stage? It seems as tho both approaches supply indispensable data for an adequate realization and intelligent attack upon these problems. Neither approach should be neglected.

Having reached the conclusion that both courses are desirable, how are we to teach them for maximum understanding?

Curriculum Organization

We believe that any plan which loses sight of the essential nature of the subject matter and the concepts it is peculiarly adapted to convey is unrealistic and its doubtful values are likely to be dissipated. Specifically, world history must be a continued story from beginning to end. Its chronology, its causes and effects, its central theme of time and continuity must be kept intact. The excellent organization of integrated historical units in the tables of contents of most of our high school texts are not to be cast lightly aside for units hastily conceived and executed. Teacher-made units often destroy the continued story effect, or continuity in time which is the essence of historical development. Our first point then in the teaching of world history is to follow a chronological guide prepared by experts in the field—teach and learn the record and sense the ideas, moral values and attitudes this record conveys.

Many segments of the historical record must be taught with only casual reference to natural or geographic forces because even tho these forces might have played decisive roles, the present state of research recognizes them as secondary or incidental to the social, emotional, and spiritual nature of man's reaction to his problems. However, geographic conditions will often help explain why things happened as they did. All events occur somewhere and the nature of the place itself often has great bearing upon their causes and courses. Therefore, the greater knowledge of places serves to increase our understanding of the past. The value of a history teacher having sound geography training is evident, but there is a danger that since the record itself makes up the bulk of the study, one is likely to be either superficial or too complex with his geographic interpretation of events unless the student has been equipped beforehand with an understanding of natural principles.

Just as a person cannot extract square roots without knowing the multiplication table, it is unrealistic for us to suppose that one can make a geographic analysis of historical events unless he first knows the nature of such factors as location, sizes of land masses in terms of area and the number of people who inhabit it, climate, land forms, presence or lack of resources and others. We say the student must be equipped with these yardsticks of analysis before he can adequately explore or understand the relation of natural circumstances to historical events, else the study will be one of geographic principles while the moving record is neglected. Subject matter is broken into areas and segments to expedite our grasping of something more than a superficial knowledge of same.

Compartmenting subject matter for convenience and depth of treatment is not incompatible with a horizontal type of integration of the material with other subjects and with present day conditions for effective realistic teaching. Our second point in the teaching of world history is that the subject matter compartments should be kept intact and that it is preferable for a student to have a background course in world geography in the ninth grade. If this isn't possible it is much better to have them concurrently than for either to be omitted. World geography following world history is better than omitting either but it is not as good a sequence as geography first.

Important as the record is in attacking current human prob-

lems, the author is inclined to say that if a student must choose between a high school course in world geography and one in world history, he should choose the former. Recognizing that this will result in important gaps in his citizenship equipment, we believe that a knowledge of the natural characteristics of place are more immediately pertinent to most of man's greatest problems such as over-population, unequal distribution and deplenishing of natural resources, inequalities of income between various regions of the earth, malnutrition and epidemic disease and conflicting ideologies.

SUMMARY

In summary, we believe that both world history and world geography should be taken by high school students; that geography should come first in the sequence; that a good textbook and a chronological approach are necessary in world history; that the subjects should be taught separately with strong threads of integration running between them and other disciplines, and the past with the present; and last, that if a choice must be made between them by curriculum planners and students, that that choice should be world geography.

GEOGRAPHY FOR CHILDREN AGES 6-8*

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This paper is based on clinical studies of psychologists and experimental classroom teachers. The objectives are twofold: first, to summarize the characteristics of child development which should be considered in planning a geography curriculum for the early grades; and second, to suggest briefly a geography program based on child development and needs, which will stimulate and guide more and better geography teaching.

These comments are intended primarily for those: 1. who are concerned with planning and administering curriculums in the

* This article is a portion of a manuscript entitled "Geography for Children Ages 6-10" read before the Section on Teaching of Geography, International Geographical Union, Washington, D.C., August 8, 1952.

lower grades; 2. who are teaching children of the ages six to eight; 3. who are preparing teachers for these age levels; and 4. who are interested from a parental point of view.

Some classroom teachers have been so busy teaching geography that they have not found time to consider seriously what geography facts and principles can and should, or cannot and should not, be taught at various grade levels. This was not so with the late Lucy Sprague Mitchell, one of the greatest experimental teachers in the United States of America during the first half of the twentieth century. Summarizing her findings, she declared "Of all the subjects with which an elementary school curriculum deals, geography seems to have fared worst! Curious, that it should be so! For I believe that, of all the subjects, it holds most for children of these ages, both as an opportunity for field work and for art-play."[1]

Miss Mitchell and Geography

Since the work of Miss Mitchell will be cited from time to time in this paper to substantiate geography curriculum suggestions, it may be well to characterize briefly this noted teacher and her accomplishments. Upon her death in August, 1950, *Time* magazine, August 28, honored her with an item under "Education" entitled "Bank Street Experimenter." This item called attention to the wonderful results that she achieved during the last 37 years of her life as a classroom teacher. It credited her with starting the practice of hiring psychologists, physicians, educators and social workers to study child growth and maturity from infancy to adolescence. A short but significant article of hers entitled "Children as Geographers" appeared in *Education*[2] in 1932. Two years later she contributed a small volume entitled *Young Geographers*[3] which, in my limited experience, is without peer in the United States of America on geography instruction for children in the lower grades. Before she wrote this small book, she had experimented with children in the lower elementary grades for over two decades. Little wonder that this book is such a pioneer and truly monumental work. If I were addressing a workshop group, I would ask every member to read her article and book before examining further sources.

[1] Lucy Sprague Mitchell, "Children as Geographers," *Education,* LII (1932), 450.

[2] Ibid.

[3] Lucy Sprague Mitchell, *Young Geographers* (New York: John Day Company, 1934.)

Six Years Old

Clinical findings. After years of observation and study, what have clinical psychologists and experimental teachers learned about the six year old child? How do their findings help us to decide whether or not geography should be included in the curriculum and, if so, how it should be taught?

The six year old is an explorer. He gathers information, makes orientations and acquires experiences which are just as important to him as any explorations which adults make to gather new information about the world. Fortunately the frontiers of his world are opening and more distant horizons beckon him on.

According to Arnold Gesell and Francis L. Ilg in their book entitled *The Child From Five to Ten,* the six year old touches, handles and explores all materials. He wants to do everything. Of course there is often more activity than real accomplishment.[4] But we must not be harsh in our evaluation. The six year old is faced with the difficulty of exploring and adjusting to not one world but three worlds—the world of home, the world of school, and the world of community as far as his experiences extend and his imagination stretches. And our modern means of communication, such as radio, film and television, enable him to extend his imagination in many directions and often great distances.

The six year old attempts to orient himself. Thru exploration and observation he makes many mental images and fits these into a mental pattern or crude but functional map. His explorations take him farther and farther from his home (his base for exploration), yet he is able to return to the starting point by using familiar objects as landmarks. He can even chart new courses and return home from different directions without getting lost. These activities for a six year old are early experiences in "map reading" which logically lead to sketch and/or map construction because his world is a real place.

In fact by the time a child goes to school he has definite information about the relative location of his home, neighborhood and expanding community with streets, fire plugs, stop signs, driveways, sidewalks, etc. Children of five and six can often draw rough sketches of their neighborhood. Their limitations seem to be more

[4] Arnold Gesell and Francis L. Ilg, *The Child From Five to Ten* (New York: Harper and Brothers, 1946) 101.

a lack of muscular skill and drawing ability than of knowledge because they often can supply the geographic information in answer to questions. In their minds they map their environment in sufficient detail to navigate over its surface by recognition of familiar landmarks. Naturally their mental map constantly undergoes changes. Children of six to eight years are often able to supply more information about their small local environment than are adults who live in the same areas. Adults do not cover the local area in so much detail on foot day in and day out, week in and week out, nor are they as observant.

The child at six is an experimenter. He will try something over and over again, make this change or that change until he finally succeeds by the old trial and error or success method or gives up temporarily to try again another day. If his mud pie falls apart when dry, he may put in some sticks or leaves the next time. If he finds his mud pie is too wet, he may add some more earth, and if too dry, he may add more water. If he cannot get his mud pie out of one type of tin or pan without breaking it, he uses another type of tin or pan. If he wishes to make pies of different shapes and sizes he uses tins or pans of different shapes and sizes.

Perhaps all of you have observed children pour water on the ground. And perhaps you have observed them dig up the soil to see where the water has gone and then pour more water in the hole. Have you watched children follow a rill of water over a yard or field or along a street curb after a storm? Have you seen them throw sticks, leaves, papers and stones in the water to find out what will happen? In these ways children perform experiment after experiment without parent or teacher supervision, direction of encouragement, and often in spite of discouragement by parent and/or teacher.

The child at six is a collector. We know from scientific investigations and personal experience that many children start "collections" at this early age. Some of these collections are abandoned but some are retained thruout life and some become the basis of an occupation or profession.

The child at six is an actor and imitator. He observes people and their activiites. He tries to copy them. Because of his great ability to make-believe, he is not handicapped by size or equipment as adults would be. In this imaginative mind a dozen corn cobs may be a dozen horses in a pen one minute and a dozen cars in a parking lot the next. All the cobs or blocks may be the same color, but if he

puts three of them in one place and tells you they are black cars and puts two more in another place and tells you they are red cars —so they are in his mind. And often children get provoked or disgusted with adults because they pay so little attention or forget which cars are the black and which cars are the red.

This ability and experience in "make-believe" should be used more in introducing map symbols. In his play the six year old child repeatedly uses one object to represent or symbolize another. He may use a plastic automobile from a ten cent store for instance as a symbol for a milk truck, moving van, laundry truck, racer, bus or any other vehicle. With this background he readily can see how a small house symbol may be used to represent a dwelling whether constructed of wood, brick, stone; whether it is large or small; or whether it includes a single family unit or multiple family units. Consequently, the transition to using a dot to represent a house or ton of hay or a thousand hogs is not as great as may be supposed at first, providing the teacher makes use of the child's experience by beginning with the object in reality and then helps him to select an appropriate symbol to represent it.

It is normal for children to relive their experiences in play.[5] Self-motivated play contributes to both physical growth and learning. The school thru its supervisory program and equipment should afford the child many useful new experiences which he may relive in his play. The teacher should direct his energy and dramatic self-projections into channels which will strengthen his later learning activities. Activity programs and projects are needed to help the child to set in operation and organize his own self-activity. He learns more readily by well-directed, creative play than by rote.

Curriculum implications. Do orientation, exploration, observation, experimentation and collection of interesting objects help the child to gain geographic knowledge? If so, then a six year old has placed geography in his own curriculum whether the teacher, parent or school administrators know it or not. In fact, many authorities believe this type of experience is absolutely essential and must be obtained before the child can start to master effectively his tool subjects of oral expression, reading and numbers.[6] We who stress

[5] Ibid., 95; Gladys Gardner Jenkins, Helen Shacter, and William W. Bauer, *These Are Your Children* (Chicago: Scott, Foresman and Company, 1949) 47, and Elizabeth Hurlock, *Child Development* (New York: McGraw-Hill Book Company Inc., 1950) 339.

[6] George G. Thompson, *Child Psychology* (New York: Houghton Mifflin Company, 1952) 365.

reality in geography teaching should face reality in child development.

How can we channel the normal interest, curiosity and activity in the six year old child so that he may profit most from his experiences? Here are a few recommendations:

1. Provide numerous window and schoolyard observation periods.
2. Arrange many short excursions outside of the schoolhouse and yard.
3. Plan the year's program of observations and excursions so that a variety of major geographic items, both physical and cultural, may be observed.
4. Demonstrate effective methods of observation, followed by clear and accurate description.
5. Provide opportunities for vertical perspectives as well as horizontal perspectives, as by a trip up a hill or a ride in an elevator.
6. Provide suitable materials and promote activities and projects in the classroom so that the child may relive his observations in creative play.
7. Encourage construction of and play with tool maps.
8. Stimulate simple experimentation with earth and water, both indoors and outdoors, as in planting and watching plants grow.
9. Select carefully and read repeatedly appropriate stories, bearing on such topics as transportation, housing, animals, plants and weather.
10. Prepare a check list of basic geographic concepts the six year old child may be expected to learn.
11. Provide geography readers for both browsing and reading before the end of the year's work.

SEVEN YEARS OLD

Clinical findings. What behavior characteristics of the seven year old child are especially valuable in geography curriculum planning? The following characteristics have been selected.

Evidences of the increased critical capacity of the seven year old are his reflectiveness, his willingness to take time to think and his interest in conclusions and logical ends. Thru the psychological

mechanism of musing, he "absorbs, reviews, and reorganizes his experiences."[7] His mental life is more expansive and it not only includes the community but also the cosmos. Seven-year-old children are intellectually interested in a variety of local and distant physical elements of their environment such as the sun, moon, clouds, heat, fire, the earth's crust and weather. They have a normal, healthy curiosity in their cultural environment as well. They see and wonder about the policeman, the grocer, the postman, the milkman and others. They are drawn to these people who represent other ways of making a living. They daily look for the arrival of these servicemen, wave to them and, if encouraged or not too strongly discouraged, ask them many questions. Child specialists believe that the seven year old is "Beginning to manifest an almost scientific interest in causes and conditions."[8] For example, "he has given up the idea that God shoves the clouds around."[9] He discovers by observation and experimentation that the wind blows paper, sways the tops of trees and moves toy sail boats.

The age of seven is an important assimilative period in the life of the child. At this age he relates new experiences to old experiences and ponders about his accumulated experiences. A teacher who fails to realize this assimilative nature may provide experiences in a whirlwind fashion, assuming that her group all profit more by a multitude of exposures than by a smaller number of correlated exposures. The seven year old is a good listener. He often listens when adults are not aware that he is listening and he may comprehend far more than adults realize, as we all know from our own childhood experiences. The seven year old wants to be read to and he likes to hear the same story over and over again. Repetition to him is not boring but rather contributes to his learning and gives him a feeling of security.

Curriculum implications. It is quite obvious that the geography curriculum for the second grade child should gradually extend the physical and cultural geographic items of his local environment which were introduced briefly in the preceding year. Great emphasis still should be placed on orientation, observation and description, but more explanation and interpretation may be introduced.

Activities similar to those advocated for the six year old also

[7] Gesell and Ilg, *op. cit.*, 132.
[8] Ibid., 137.
[9] Ibid., 138.

are appropriate for the seven year old. Window and yard observations, excursions, experiments and demonstrations are desirable.[10] Science stories similar to those which exposed the six year old to various facets of the physical and cultural geographic environments may be used.[11] Basic concepts and understandings should be reintroduced, reviewed and enlarged as the need exists.[12] Emphasis should be placed both on thoro assimilations of preceding content and on exposure to appropriate new content.

Eight Years Old

Clinical findings. Observation of child behavior shows conclusively that an eight year old maintains an interest in both the physical and human phases of geography and that his ability to study geography in the third grade is accelerated by his all-around physiological development. The findings in the following paragraphs were not made by a geographer in an attempt to promote his subject, but rather by clinical psychologists who have studied child behavior scientifically and are interested only in the best education for the child.

It is almost trite to say that most eight year olds can keep a weather calendar.[13] They can make observations, read simple instruments, record data, write brief descriptions and of course ask many questions. Their questions, which are stimulated primarily by observations, are often basic and penetrating. They ponder about the *why* of things and seek helpful interpretation, but are not mature enough for long, detailed answers. They attempt to distinguish between fantasy and reality and fire a barrage of questions on this perplexing difference if adults will only supply reasonable answers. At this time short, clearly worded concepts which the class or teacher may construct on the blackboard and/or on note paper help a child to verbalize ideas and to summarize his thoughts and

[10] Thomas F. Barton, "Teaching Rocks in the Lower Grades," *Science Education*, XXXI (1947), 71-76.

Thomas F. Barton, "Teaching Soils in the Lower Grades," *Journal of Geography* XLV (1946), 309-316.

[11] Thomas F. Barton, "Geographic Instruction in the Primary Grades," *Geographic Approaches to Social Education* (nineteenth yearbook of the National Council for the Social Studies) (1948), 205-216.

[12] Arthur T. Jersild, *Child Psychology* (New York: Prentice Hall Inc., 1946), 367.

[13] Thomas F. Barton, "Establishing an Inexpensive Weather Station," *Journal of Geography* XL (1941), 226-230.

experiences. Of course all of this activity is at an elementary level, but it indicates a real advancement over his ability and interest of a year or two ago and is significant in terms of future growth.[14] He is becoming less self-centered, has time for other ideas than those suggested by his immediate environment and is starting to ponder the relationships of cause and effect.[15] "He is acquiring a modern, scientific outlook."[16]

In the clinical laboratory Gesell and Ilg found that he is interested in the "insides of the earth," "geography of heaven," simple maps, Indian trails, routes of pioneering covered wagons, impersonal forces of nature and cultures of other living peoples.[17]

Curriculum implications. From the foregoing we can readily see that the third grade child needs an expansive program in geography. He should review and extend physical and cultural concepts and understandings associated with his own community,[18] but at the same time should be given an opportunity to explore a variety of external factors that affect his everyday living.

The geography content for the third grader, which may well include such functional topics as food, clothing, shelter, transportation, communication and recreation, should be presented in such a way as to satisfy his inquiring nature. It should help him to understand how food is secured, how clothing is obtained and how houses are built. It should help him to investigate and to evaluate different types of transportation and communication. It should help him to explore different kinds of work, such as what a farmer does, what a policeman does, what a factory worker does. Thru such channels as these it should help him to realize the great interdependence that exists in modern society—how one individual helps another and how one community helps another.

The content should be broad enough to include both rural and urban patterns of living. If a child lives in the country, he should develop a better understanding of life in the city; and if a child lives in the city, he should develop a better understanding of the life in the country. Every child should have an opportunity to com-

[14] J. Minor Gwynn, *Curriculum Principles and Social Trends* (New York: The Macmillan Company, 1950) 270.

[15] Gesell and Ilg, *op. cit.*, 383.

[16] Ibid., 385.

[17] Ibid., 165.

[18] Arthur T. Jersild and Associates, *Child Development and the Curriculum* (New York: Bureau of Publications, Teachers College, Columbia University, 1946), 115.

pare the two types of communities, to learn in a general way what one contributes to the other and to realize why both of them are needed.

The over-all program should help the child to realize that his country has many communities, some much like his own and some very different. It should help him to realize that his country has great variety in physical and cultural features and that it has many valuable resources. It should help him to realize that he is an important citizen of his country, with many opportunities before him.

The over-all program should help the child to answer many geographic questions of a scientific nature. What is weather? What causes rain? How does rain help plants to grow? How does the sun help plants to grow? What causes day and night? What is the earth? How do we know that the earth is round? How is the earth like the sun and moon, and how is it different?

In his expanding geography program at the third grade level, the child commonly receives extensive help from other areas in the curriculum, such as reading, science and nature study, social science and even art and music. For example, he may profit by stories[19] and audio-visual aids that orient him into distant parts of the world, and thus help to prepare him for still more expansive geography at the fourth grade level. Certainly every geography teacher should take advantage of these helps and utilize them to the fullest extent for enrichment values.

During the first three years in school—ages six to eight—the child should not only gain concepts and understandings, but should establish effective techniques of learning, develop helpful skills and acquire desirable attitudes. If his geography program is carefully planned and administered, it will help him to secure well-rounded growth and will strengthen his complete educational career.

The entire geography program from the "cradle to the grave" should be based on sound educational principles, such as the following:

1. Start with the local and go to the more distant.
2. Start with the familiar and go to the less familiar or unknown.

[19] Thomas F. Barton, "The Penguin and the Ostrich," JOURNAL OF GEOGRAPHY, XXVIII (1939), 188-190.

Erselia M. Barton, "Reindeer-land and Camel-land," JOURNAL OF GEOGRAPHY, XLIII (1944), 111-115.

3. Start with immediate experiences and use them as bases for understanding likenesses and differences in other geographic settings and other ways of living.
4. Learn by doing, which, in connection with geography, means using the out-of-doors as a source region for having experiences, making observations, gaining impressions and securing information, and subsequently using the classroom as a laboratory-activities room.

Simple map making and map reading originate with the child's dramatic floor play when he first uses objects as symbols, places these objects in correct tho crude spatial relations and recognizes the association of objects one with another, no matter how simple. For example, when he uses a board for a bridge to extend from bank to bank across a blue oilcloth river and places some corn cobs on the river for boats, he devises a tool map which involves geographic thinking. From numerous simple experiences of a similar nature geographic thinking really starts and, if properly nurtured, grows and develops until the individual is able to think in terms of world wide spatial relations and complex geographic patterns and associations.

ADAM AIGENLER'S FIELD MANUAL

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INTRODUCTION

Students of the cartography of western North America during the period 1500 to 1700 have pointed out correctly that the status of California changed from peninsular (Mercator's Map) to insular (Ogilvie's Map) and back to peninsular again (Delisle's Map).

A few of the more thoro students of cartographic history credit the rediscovery of the peninsular nature of California to Eusebio Francisco Kino, a Jesuit missionary who, with compass and astrolabe, mapped most of the territory from the Rio Mayo to the Gila River during a most industrious and productive lifetime in the then ill-explored land of Papagueria, on the north and west of New Spain (now Mexico).

Field investigation of Kino's area, accompanied and followed by careful study of Kino's diaries, journals and letters (all carefully gathered together and translated by Herbert E. Bolton), disclosed that Kino, in addition to being a thoroly competent geographer in his own right, had received a thoro training in field methods under Adam Aigenler and Henry Scherer while a student at Ingolstadt (Bavaria).

Traveling constantly in Kino's saddlebags and used repeatedly by him, was a small manual of cartography, written by his former professor Adam Aigenler, and containing as an appendix Riccioli's tables of location, the most accurate available in the late 1600s.

Study of this manual, obtained in microfilm and photostat from the Library of Congress and the Vatican Library, discloses that geographic understanding in 1668 was almost a century ahead of the instrumentation necessary to apply it. It was not until 1682 that consistent observations of longitude were possible on land (Cassini's observations and maps); and measurements of longitudes at sea were not possible with any great accuracy until the development of the marine chronometer, almost entirely the work of Harrison, in the period 1735-1765. The hour glass used to time watches on Spanish ships was not accurate enough for marine navigation, even when it had been specially blessed and contained the ashes of a heretic.

The Author

Adam Aigenler, the author of this field manual, was born in Tramin, Tyrol, in 1635, and taught mathematics and Hebrew at the famous Jesuit university at Ingolstadt from about 1664 until 1672. During this time he trained a large number of Jesuit missionaries in cartography, and, due in large part to his efforts and those of his co-worker, Henry Scherer, these missionaries later mapped China with great accuracy. Aigenler himself left for China in 1672, where he died of "peste" in 1673.

The Field Manual

Adam Aigenler's principal work, his field manual, published in Latin in 1668 at Ingolstadt, bears the somewhat fearsome title "Tabula Geographico-Horologa Universalis, Problematis Cosmographicis, Astronomicis, Geographicis, Gnomonicis, Geometricis Illustrata—". Title page of this work constitutes Fig. 1.

TABVLA GEOGRAPHICO-HOROLOGA
UNIVERSALIS,

PROBLEMATIS

COSMOGRAPHICIS, ASTRONOMICIS,
GEOGRAPHICIS, GNOMONICIS,
GEOMETRICIS
ILLUSTRATA,
ET
VNACVM SUCCINCTA METHODO
QVASLIBET MAPPAS GEOGRAPHICAS
DELINEANDI.
PUBLICO CERTAMINI PROPOSITA
IN CELEBERRIMA, CATHOLICA
ET ELECTORALI UNIVERSITATE
INGOLSTADIENSI,
PRAESIDE

ADAMO AIGENLER

SOC. JESV, SACRÆ LINGVÆ ET
MATHESEOS PROFESSORE
ORDINARIO,
DEFENDENTE
JOANNE FRANCISCO STAVD-
HAMER, VILSBIBURGENSI BOIO,
PHILOSOPHIÆ ET MATHESEOS
STVDIOSO,
MENSE AVGVSTI, ANNO M.DC. LXVIII.
INGOLSTADII, Typis Ioannis Oſtermayri.

FIG. 1. Title page of Adam Aigenler's "Tables," printed in Ingolstadt in 1688 by John Ostermayr. This is an unretouched photograph, showing not only the effects of nearly three centuries of time, but also many of the initial imperfections of type and impression.

General format of the book is much like that of a modern technical work. After a dedication to Pope Gregory, the author tersely defines all terms and symbols used. The symbols are quite similar to those now used by astrologers, but in 1668 they were the standard abbreviations for the seasons and the names of celestial

bodies. Definitions are quite clear, as will be shown by the quoted examples:

"*Eclipsis Lunaris* est Privatio luminis in Luna ob interpositionem terrae inter Solem et Lunam."

"*Latitudo* loci est distantia ipsuis ab AEquatore recta versus Polum procedendo."

After defining his terms, Aigenler proceeds to state and solve 50 typical problems in navigation, geography and cartography, using the methods of trigonometry insofar as possible. In this section graphical methods are introduced. Much emphasis is placed on the method of meridian altitudes, particularly when the sun is in the ecliptic, for determining latitude easily, and a table is included "Tabella Declinationum Solis ab AEquatore—" for correction for date. Altho modern tables are much more extensive than those of Aigenler's time, the method, being both simple and accurate, is unchanged since his time.

Because several prime meridians were used by cartographers in the mid-1600s, the problem of converting longitudes from one base to another received considerable attention, and Aigenler includes a table showing how to convert longitudes referred to one prime meridian to those referable to another. Prime meridians of that time included "Palmam Insulam, ex Canarijs" (Palma, in the Canary Islands), Tenariffe, San Vincente (Azores) and Corvi (Azores).

Methods of determining time, vertical distances and even the heights of clouds are outlined. Finally, a method for telling time at night, when a sundial will not work, is indicated. Because the included tables are quite short, methods of interpolation are shown and attainable accuracy, with these relatively crude methods, is surprisingly great.

Eight quick methods for making maps are outlined. These are largely descriptions of projections, most of which are still included in textbooks on cartography.

Having faith in his methods and knowledge, the author includes as his major illustration a map of the known world (Fig. 2), with various tables and instructions added. Perusal of this map shows that latitudes are usually given within reason, but that longitudes, which could not be measured very well at the time, are not always correct. In consequence, Asia is shown too narrow, as is the Pacific Ocean, while North America is shown too wide.

Contrary to contemporary opinion, Aigenler shows California

as a peninsula, and the "Strait of Anian" occupies an area about where Bering Strait now is. Whether Aigenler arrived at his opinion by use of the reports of the Alarcon and Diaz expeditions (1540-1541); used the logs of the English sea raiders, contemporaries of Drake and Cavendish; or merely stated his personal belief, is not made clear by his writings. Most maps of the mid-1600s show California as an island, separated from the mainland of

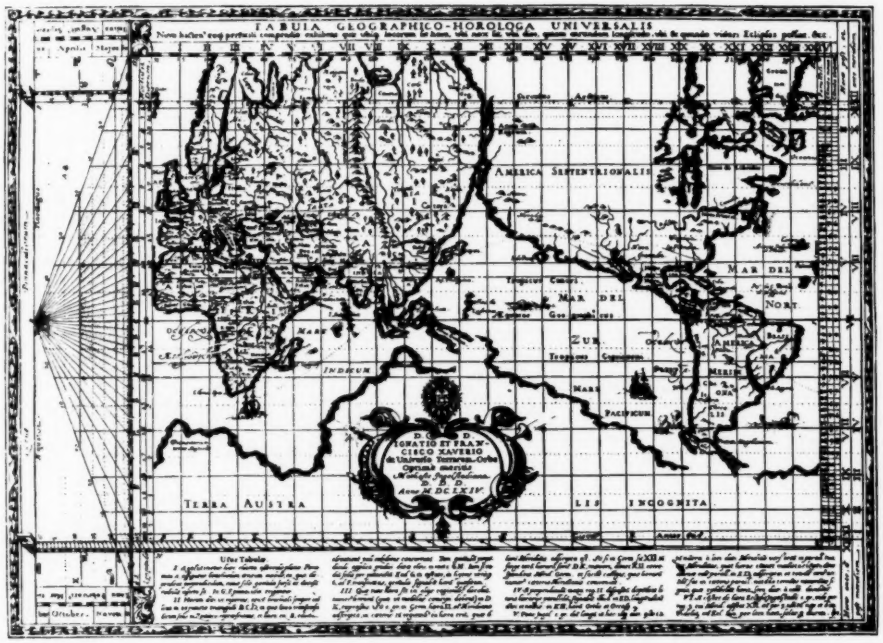

FIG. 2. Adam Aigenler's map of the world, as it was known in 1664, with its accompanying nomograph for correction of measured latitude for the sun's declination. Longitudes here were estimated eastward from the Canary Islands.

North America by the Strait of Anian, which supposedly connected the Gulf of California with the Pacific Ocean.

As a major and important appendix to his manual, Aigenler includes Riccioli's tables of latitudes and longitude, which also formed Part IV of Book 9 of Riccioli's 12 volume work "Geographia et Hydrographia Reformata," published in Bologna in 1661. These were the most accurate tables then available. Altho "piracy" of technical works was a standard practice at this time, Aigenler credits the source of these tables fully. Similar tables are to be found in the back of almost any good modern atlas. A small portion of these tables comprises Fig. 3.

The present location of "Messico in Nova Hisp." (Mexico City) is Lat. 19°24′ N.; Long. 99°11′ W. (of Greenwich). As the prime meridian of Riccioli's tables passes thru Palma in the Canary Islands, which is 17°52′ W. of Greenwich, Mexico City is 81°19′ west of Palma, or 278°41′ East of it. Comparison of values shows that Riccioli's location is about 1°16′ too far north, and about 1°41′ too far west, producing a total error of about 115 miles. This is

Melinda in Africa.	Melinda.	0	30	A	59	10
Meliquæ inſu. a Orientalis.		9	2		97	53
Meliſſo in Morea.	Meliſſus.	37	24		47	22
Melung in Francia.	Melodunũ.	48	28		24	59
Memel in Livonia.	Memelia.	55	48		44	50
Memmingen in Suev:	Memminga.	47	53		33	11
Mentz in Auſtraſia.	Moguntia.	50	8		31	0
Merida in Eſtremadura.	Emerita	38	54		14	56
Merida Nova in nova Granata.		8	10		310	58
Meſſarano in Pedem.	Meſſeranũ.	45	17		30	55
Meſſena in Morea.	Meſſene.	25	36		46	12
→ *Meſſico in nova Hiſp.*	Mexicum.	20	40		277	0
Meſſina in Sicilia.	Meſſana.	38	21		38	56
Methona in Cherſoneſo.	Methone	36	56		48	31
Metz in Lotharing.	Metz.	49	10		29	9
Meulan in Franc.	Medulania.	48	58		24	1
S. Michel, vel monte S. Michel in						

Fig. 3. A small part of Riccioli's table of latitudes and longitudes, which comprises an important part of Aigenler's "Tables." Arrow points to the description of Mexico City. Names were given in their common ("vulgar") form, followed by their Latin form. Latitudes, in degrees and minutes, are stated in the first two columns, Longitudes east of the Canary Islands, in degrees and minutes, in the second pair of columns. South latitudes are designated by the letter "A" ("Australis").

quite a distance to walk, but is actually less than two and one-half per cent of the distance from Palma.

Distribution of Aigenler's Manual

Aigenler's Field Manual was small enough to fit into a saddle-bag, and contained most of the practical data included in Riccioli's nonportable 12-volume "Geographia," as well as a considerable amount of intensely practical field methodology. In consequence, the manual was widely distributed, many copies going to the far places of the earth such as China, South America and the southern half of North America. In each of these areas Jesuit missionaries produced improved maps in the half century after 1668. In some areas at least, the map improvement was directly due to Aigenler's teaching and the use of his manual.

Perhaps the best example of a map directly resulting from the competent use of Aigenler's Manual is the Kino Map "Passo por Tierra a la California" (1701), which shows clearly and correctly that the Gulf of California is a closed sea and not a strait. A tracing of this map comprises Fig. 4. Field checking of the map, which did not become completely obsolete until about 1909, discloses that it is remarkably accurate. When used in conjunction with Kino's diaries and journals, almost every place shown on this map can be relocated beyond any reasonable doubt. About half of the places listed still exist with either the same name or one quite similar (i.e., San Marcelo of the map was completely named San Marcelo Sonoitac, and is now known as Sonoyta).

Like Aigenler, Kino credited the sources of his information, stating in his diary, "That map, which I brought with me to the Indes and even to these new conversions—depicts California very correctly not as an island, but as a péninsula" (Bolton translation, 332). He also plainly described his meridian altitude observations (near the head of the Gulf of California, March 3, 1702, Bolton translation, 341), "At midday we took the altitude of the sun with the astrolabe, and found it to be 52 degrees, which, adding to it the six and a half (degrees) of south declination of that day, made 58 degrees and a half. The complement for 90 degrees is 31 degrees and a half, and this was the altitude of the pole or geographical latitude in which we found ourselves."

Other less well documented examples of use of Aigenler's field manual can be found in the archives of several nations, so that as a direct result of one small book, many thousand square miles of the earth's surface were accurately mapped.

OTHER NOTES

Aigenler terminates his manual with a short poem, and at the end are ecclesiastical endorsements indicating that the work is not heretical and suggesting that further geographical work might be fruitful. It is possible that this manual constituted Aigenler's Doctor's thesis in Geography—his third Ph.D. if that is the case, for he already held doctorates in Philosophy and Mathematics! The theological acceptability of the work is attested to by Joan Baptista Weiss, S. J., and the philosophical approbation is signed by Benno Perfall, S. J., both professors and deans of the college of Ingostadt.

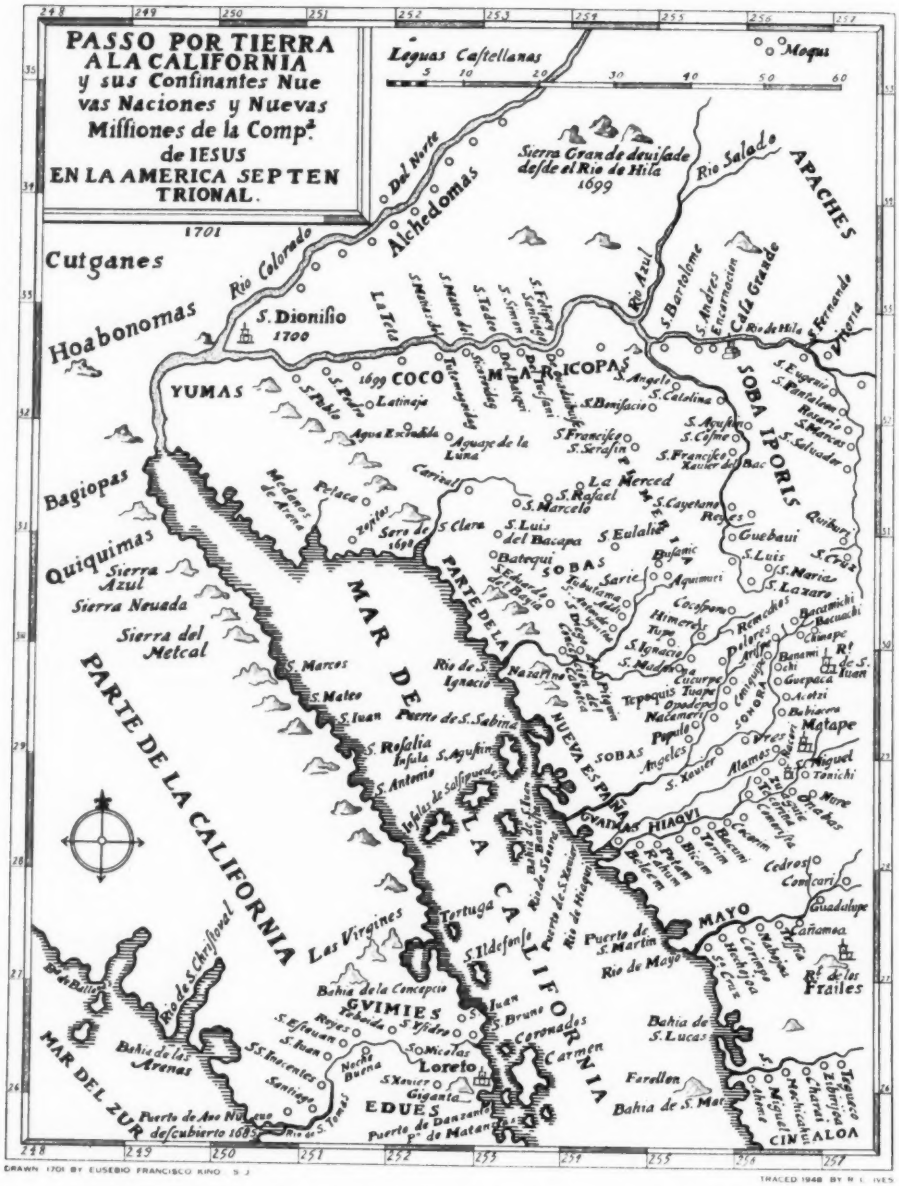

FIG. 4. Kino's map of Papagueria, showing clearly that the Gulf of California terminates in Latitude 32°, and that California is a part of the mainland of North America. This is a tracing from a photostat of the original.

ACKNOWLEDGMENTS

During the investigation of Aigenler's Field Manual, bibliographic assistance was received from the Denver Bibliographic Center, the Library of Congress and the Vatican Library. Much helpful assistance in the translation of ecclesiastical Latin into modern English was given by the late Frank Thone of Washington, D.C., and the Rev. George Zimpfer of Williamsville, New York. A large part of this study was possible only because of the previous work of Herbert E. Bolton in collecting and translating the Kino diaries and notes.

AERIAL MAPPING IN THE SANTA CRUZ REGION OF BOLIVIA

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People inhabiting underdeveloped areas are not always poor because the land on which they live lacks resources; they are poor because for one reason or another available resources are not being utilized to improve their standard of living. It is now generally recognized that submarginal living standards cause economic and political instability which in some instances results in the spread of communism to these areas. Consequently, in order to improve living conditions, increase health and educational opportunities and bring the resources of underdeveloped regions into the flow of world trade, economic and technical assistance agencies have inaugurated extensive programs in various parts of the underdeveloped world. Among these agencies are: the Technical Cooperation Administration (Point Four), the MSA Technical Assistance Fund (Europe and the Mediterranean), the Technical Assistance Division of the United Nations and the Colombo Plan for Cooperative Economic Development in South and South-East Asia.

ACCURATE BASE MAP NEEDED

Technical assistance experts now agree that compilation of an accurate base map is the first step in the resource appraisal leading to the economic development of a region. The establishment of transportation and communication facilities, manufacturing plants and agricultural industries depends on the availability of accurate

distributional data in graphic form from which surface configuration, soil types, forest species and land use can be visualized. Compiling an inventory of a region's resources and planning for progressive economic expansion now requires the rapid construction of accurate maps. Existing maps of underdeveloped areas invariably are the result of reconnaissance, consequently are too inaccurate for developmental purposes. Moreover, contemporary surface methods of mapping are time-consuming and costly. All important points are visited on the ground and mapping teams must be maintained in the field for long periods. By using vertical photographs taken from an airplane, however, accurate maps of underdeveloped areas can be obtained rapidly and inexpensively. This paper deals with an aerial survey of the Santa Cruz region by the Bolivian Air Force to aid Point Four and local officials in planning the intelligent exploitation of this region's abundant natural resources.

The semi-tropical Santa Cruz lowland of Bolivia is capable of producing many agricultural products needed by the rest of the nation—cotton, sugar, rice, vegetable oils and others. Presently most food products are imported to sustain the densely populated but mineral rich highlands, which requires the government to use scarce foreign exchange to import agricultural products that could be grown locally. Rather than purchasing machinery with which to establish manufacturing industries, the foreign exchange earned by the sale of minerals buys food only. For this reason Point Four technicians and Bolivian officials are attempting to develop the full agricultural potential of the Santa Cruz area. If their efforts are successful, foodstuffs may soon be transported over the new Cochabamba-Santa Cruz Highway and into the highlands where they are needed.

In order to construct the map which will contribute so much to the success of this developmental effort, the Bolivian Air Force contributed a completely reconditioned AT-11 Beechcraft airplane adapted for aerial photography, a crew of four including the pilot, Lt. Col. Walter Arze; the photogrammetrist, Lt. Rudolfo Saavedra; the camera technician, Lt. Guillermo Mendoza; and the airplane mechanic, Lt. René Montes. The BAF also contributed a Fairchild K-17 aerial camera and the laboratory facilities and personnel to process the film. The Point Four contribution included the film, paper and developing chemicals. Thus, the contribution of the Bolivian government was many times that of Point Four.

THE AREA PHOTOGRAPHED

The AT-11 airplane was attached to the air base in Santa Cruz while the photographic mission was in progress (See map). The area photographed extended from the paved highway south of Santa Cruz to an east-west line 10 miles to the north of the Bolivian Development Corporation's agricultural experiment station at General Saavedra and from west of the Rio Piray almost to the Rio Grand on the east. A special photo mission was flown along the entire length of the asphalt highway to the south of Santa Cruz. The agricultural experiment station at General Saavedra was re-photographed at low altitude; the area to the east of Warnes and Montero was included in the general high-level photography.

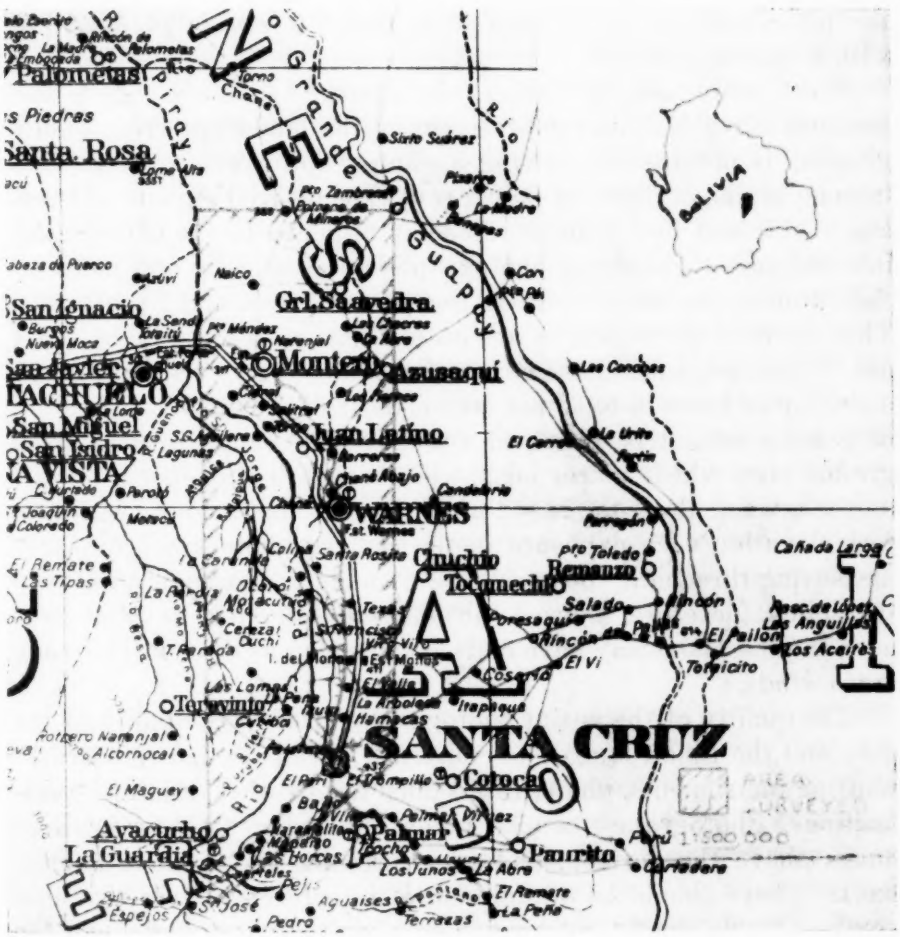

FIG. 1

Photographic Techniques

Most of the photography was accomplished at a scale of 1:20,000. In order to obtain this scale, the airplane maintained a constant altitude of 11,500 feet (10,000 feet above the surface of the earth). The altitude at which a plane must fly to obtain photographs of a desired scale is determined by multiplying the focal length of the camera lens by the desired scale of the photography. For example, to obtain photographs with a scale of 1:20,000, the focal length of the camera lens(one-half inch) is multiplied by the denominator of the desired scale (20,000) and the product is the elevation in feet above the ground (10,000) at which the plane must fly. Add 1,500 feet to this total to compensate for the elevation of Santa Cruz above sea level and it can be readily determined that the plane must fly at 11,500 feet in order to obtain photographs with a scale of 1:20,000.

Stereoscopic interpretation (the ability to identify objects and measure elevations and depressions in the landscape from photographs) is obtained by having a photograph overlap the preceding one in line of flight by 60 per cent. The desired amount of overlap is obtained by the intervalometer attached to the camera. An intervalometer snaps the photographs automatically and is set by determining the ratio between the planes speed and its altitude. Thus blurred photographs are automatically prevented. In order not to have gaps along the edges of the photos between flight lines, a sidelap of from 15 to 30 per cent is desirable. The proper amount of sidelap cannot be obtained automatically but is insured by a ground crew which spaces large white markers at proper intervals on the ground along the base line of the area being flown. At 10,000 feet elevation each exposure in the camera photographs an area measuring three miles on each side. Spacing ground markers every two miles, therefore, allowed for sufficient sidelap to prevent gaps even tho the plane may have drifted somewhat as a result of strong cross winds.

The quality of the aerial photography affects the quality of the map and the time required to construct it. For use in stereoscopic plotting instruments, photographs must meet rather exacting specifications. Photography can be taken only when the sun is three hours above the horizon, and when streams are in their normal banks. There should be a minimum of interference from haze and smoke. Clouds should not appear between the photo plane and the

ground because each cloud would appear on two portions of the photograph. That portion of the earth under the cloud would not be seen and the shadow thrown by the cloud would obscure the ground at a second point.

A calibrated precision type aerial camera should be used. The Fairchild K-17 aerial camera used by the BAF to photograph the Santa Cruz area is one of the best obtainable for this type of work. It incorporates an arrangement to insure that the film remains flat at the instant of exposure, in so far as this is possible. A minus-blue filter with an anti-vignetting metallic coating covers the six inch focal length lens. All wide angle lenses permit a greater amount of light to enter at the center of the lens than around the edges. A metallic coating (anti-vignetting) is placed on the filter to reduce the amount of light passing thru the center of the lens, thus permitting an even exposure over the entire surface of the film. The K-17 has a variable speed shutter and an intervalometer, already discussed, which permits greater accuracy in exposure. When mounted in the plane, the camera should be free of engine exhaust flow, oil fume outlets and air turbulence caused by the propellers.

In flying a photographic mission the altitude of the plane should vary as little as possible. It required an expert pilot such as Lt. Col. Arze to hold departure from the specified altitude to less than two per cent lower and five per cent higher than 11,500 feet, the maximum clearance allowable in the gusty atmophere over Santa Cruz. Crabbing, which occurs when the axis of the plane's fuselage is angled from the line of flight, must be less than 10 per cent between any two consecutive photographs. Tilting of the plane due to air turbulence or for other reasons should not exceed four per cent in any one photo and should not average more than two per cent in any 10 mile section of flight.

Indexing

To avoid confusion after the photography was developed and printed, rather comprehensive indexing was required. The day, month and year of the photography, the roll number, the number of the exposure on the roll and the project number were placed along one edge of each photograph. On flight lines running from east to west the date of exposure was placed in the SW corner and the project designation in the NW corner. On north-south flight

lines the notations were placed to read from the south side. The approximate scale, obtained by measuring the distance between two objects on the photograph whose exact ground distance is known, was placed on the first and last negative in each flight line and on the first and last negative of each roll.

CONSTRUCTION OF BASE MAPS

The next step was the construction of the base map. Base maps may be made from aerial photographs by either the slotted template method or by stereoscopic instruments. Names of some of the instruments designed to make topographic maps from aerial photographs are: Multiplex and Kelsh Plotter (American), Wild (Swiss) and Santoni (Italian). The Instituto Geografico Militar in La Paz has just received one Santoni instrument, but it must be converted to take United States film sizes before it can be used effectively with the K-17 aerial camera. The slotted template is not as accurate as the stereoplotting method but may be used to make a good base map rapidly. With the assistance of a technician this type of map now can be constructed in Bolivia. The photographs of the Santa Cruz region, however, are being sent to Panama and the United States for use in stereoplotting instruments there and the completed maps will be returned to Bolivia.

To insure further accuracy in the construction of a base map, ground control is absolutely necessary. This was obtained from plans of the Montero Highway, the asphalted section of the Cochabamba-Santa Cruz Highway and the Brazil-Bolivia Railway. Base line information obtained from the Instituto Geografico Militar and Inter-American Geodetic Survey field teams operating in the Santa Cruz area was also beneficial. Thus the exact ground distance between points identifiable on aerial photographs was obtained so the accurate scale of the photography could be determined.

When the base map is completed, information obtained from stereo-interpretation may be transferred from the aerial photographs. Physical characteristics of the land, such as slope, degree of erosion, type of drainage, soil types, forest cover and cultural features such as crop, pasture and undeveloped land, size of towns, property lines, transportation and communication systems may now be plotted on the base map. All this significant map information comprises an integral part of the resources inventory which measures the physical and human resources of the area, and from which a logical plan to develop the region is devised. After lying

dormant for centuries the Santa Cruz area of Bolivia is belatedly emerging from its economic cocoon. Aided by the developmental plan stemming from the BAF's aerial mapping and the resources inventory, agricultural production on the *haciendas* surrounding Santa Cruz may soon satisfy the nation's food requirements.

GEOGRAPHICAL PUBLICATIONS

Pipaluk Freuchen. **Eskimo Boy.** Lothrop, Lee and Shepard Co., New York, 1951. $2.00.

Ivik is just a frightened, broken-hearted little boy when he realizes that the job of being the "man in the family" is now his since his father was killed in a tussle with a walrus. His greatest responsibility is to provide food for the family of six and the dogs who pull the sleds. This is hardship enough for a young lad, but when his kayak floats out to sea because he forgot to tie it up, the problem of food-getting is greater than ever. As the days go by it becomes necessary to kill the dogs they have raised from pups in order to keep the family alive. Not until the water freezes over can anyone make the long dangerous journey to the mainland where stores of food are kept. Then it is Ivik who offers to go even tho he is frightened about it. His adventures on the trip make a story full of suspense.

After reading *Eskimo Boy* one is left with a great feeling of admiration for the child who suddenly becomes a man. A new picture of Eskimo life as it really is creates a feeling of sympathy for their lot and wonder at their ability to keep alive when all things seem to be against them.

The fourth graders who heard this story listened with eager ears and tearful eyes because there is no glamour in the life of Ivik, Eskimo Boy.

IDA M. LAUTZ

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Nels A. Bengston and Vera E. Rigdon. **Economic Geography Manual.** Prentice-Hall, New York, 1952, 2nd Edition. 218 pages. $3.25.

The stated purposes of the manual are: 1. to encourage careful reading of the text (Bengston and Van Royen, *Fundamentals of Economic Geography*) and to provide some aid in differentiating between major and minor aspects of the discussions presented; 2. to encourage thinking in connection with reading and, thus, to realize that rational thought must necessarily be based on facts if valid conclusions are to be reached; 3. to aid in developing the habit of discriminating between facts and opinions. The authors succeed in accomplishing these objectives. No student could successfully answer the series of discriminating questions without reading perceptively. Many of the questions require more than factual answers. The student must use his mental faculties to arrive at an adequate answer to many of the thought-provoking queries.

Statistical data, derived from reliable sources and covering a broad scope of material, is included in the last forty pages of the manual. Altho constant reference is made to maps and charts in the textbook, in the opinion of this reviewer there is an insufficient number of maps, graphs and charts within the manual itself.

Much of the first forty pages of the manual deals with elements of the physical environment. In this section, at least, the title *Economic Geography Manual* is a misnomer. It is a mistake to criticize the manual on this point, however, since it correlates precisely with *Fundamentals of Economic Geography*.

The manual would serve a useful purpose where there is available time for student work in the classroom. In addition, the manual is a useful device which insures that the textbook is read.

ARTHUR H. DOERR

University of Oklahoma
Norman

Mary Lusk Pierce. **The Community Where I Live.** Allyn and Bacon Inc., Boston, 1952. 140 pages and illustrations.

As an initial experience in the field of geography, *The Community Where I Live* provides an easy introduction for the third grader. Out of a wide teaching experience Mary Lusk Pierce demonstrates her knowledge of a child's learning needs.

The book abounds in colorful illustrations, thus picturing new concepts as they are being developed. All illustrations tie into the text by a series of pertinent questions. The sections devoted to weather observations are particularly well placed, beginning with the fall and continuing at stated intervals to the summer. The child, therefore, in his studies has continual first-hand observation and source material with the weather at hand.

Strong points in this book, one of the Stull-Hatch Series, may here be noted. 1. Word study exercises and unit check-ups which are most valuable to a third grade teacher who does not use the standardized workbooks. 2. Chart arrangements for keeping weather records are simplified to third grade level. 3. Tinker and Tiny, two small figures, carry thru the book, and by their actions demonstrate such words as fog, rain and soil. 4. Continual stress is laid on the "Do I Remember" sections as a means of recall or introduction to the new topic. 5. The type, black and large, is especially good for eyes accustomed to focusing on large objects. 6. Related poems scattered thruout the text break the serious trend of the studies.

Altho the word study is well demonstrated it is doubtful that an average third grade would be capable of comprehending such words as precipitation, velocity, feldspar or humidity. The material is logical in arrangement, but lack of a narrative approach may be a drawback to a youngster whose primary interest is still a story.

The Community Where I Live will continue to be desired as a beginning geography text, because it explains clearly to the child and assists the elementary teacher in her presentation of new concepts.

MARION R. CHALMERS

Smallwood School
Snyder, New York

Norman J. G. Pounds. **The Ruhr.** A Study in Historical and Economic Geography. Indiana University Press, Bloomington, 1952. 283 pages. $4.00.

This is a most welcome book on one of the key regions of the world. Altho there existed a tremendous literature on the various aspects of *The Ruhr* and even a great German standard work (now out of date) by the geographer H. Spethmann there was lacking a concise geographic treatise in English. Dr. Pounds has filled this gap in admirable fashion. The book is a scholarly work but so skillfully organized and so well

written that it will certainly appeal to a wide public beyond the circle of geographers.

After an introductory overview the author deftly sketches the patterns of cities and industries "in about 1800, about 1850 and about 1900 as a prelude to the examination of the Ruhr in the mid-twentieth century." It is somewhat surprising to read in the next sentence: "No particular importance is claimed for the dates or periods of the historical surveys of the region." One would have thought that the author either had good reasons for his choice and would proceed to say so or that he would have selected other date levels. Actually his presentation works out quite well.

The Ruhr today is discussed in four highly informative chapters dealing respectively with the Coal Industry, the Iron and Steel Industry, Transportation and Problems of Social Geography. A final chapter discusses objectively the controversial topic of "The Ruhr in the Economy and Politics of Europe." Each chapter has a rich appendix of bibliographical notes. The book is well illustrated with 36 maps and diagrams. A larger general identification map would have been helpful. Altogether it is a very instructive and attractively written study.

JAN O. M. BROEK

University of Minnesota

Stacy May, Just Faaland, Albert R. Koch, Howard L. Parsons, and Clarence Senior. **Costa Rica: A Study in Economic Development.** Twentieth Century Fund, New York, 1952. xiv and 374 pages. 2 maps, tables, appendices, index. **$3.00.**

The aim of this volume is to present a case study, with Costa Rica as the "guinea pig," to point out the benefits of Point Four aid likely to be most effective in an underdeveloped country.

Several suggestions as to the implementation of this program in the given circumstances are presented by the five authors in a well-integrated style. Among the plans and projects which are realistically discussed is a proposed cement plant. Altho at present cement is imported, it might be manufactured locally with the use of native raw materials, provided that the domestic market could be expanded to utilize the output of a plant large enough to be profitable.

A typical suggestion in the field of agriculture is to promote greater domestic production of fats and oils instead of depending upon the importation of lard.

The text systematically covers the major activities of economic importance in Costa Rica, including agriculture, other extractive industries, manufacturing and processing, utilities and commerce, health and welfare, foreign trade and payments, capital investment and savings, and banking policy and foreign exchange.

Admittedly it is a preliminary survey, compiled during a field study of six or seven weeks; therefore much of the material that might be useful to geographers is highly generalized. Parts of the work may be more pertinent to the interests of economists than to geographers, and yet all in all the volume may well be recommended to any geographer who is interested in Central America or in Point Four.

ROBERT N. YOUNG

Indiana University

United States Population Distribution, Urban and Rural, 1950. U.S. Bureau of the Census, Washington, 1953. Map, 60 x 38 inches, scale, one inch equals 50 miles. **35¢**

This map of population distribution in the United States as of the 1950 census is a basic tool which should be in every classroom and in the hands of every geographer

doing research on any areas within the United States. It is a reference map rather than a wall map, for the symbols, other than those for the urbanized areas, do not show up against the white background at any distance.

The map contains no orientation other than state boundaries, and no names of places are given in order not to obscure any of the population symbols.

Urban and rural population are differentiated by color: a purplish tone for urban and green dots for rural population. The rural population is shown in two sizes of dots, a large one for places of 1,000 to 2,500, and a small dot, each of the latter representing 500 persons living outside of places of 1,000 or more. Four symbols are used for the urban population. Urbanized areas as defined by the 1950 census, each containing one or more cities of at least 50,000 together with adjacent built-up areas, are depicted by solid color within the areas so that the actual extent and shape of each urbanized area are shown. Smaller urban places are represented by three sizes of dots: 25 thousand to 50 thousand, 10 thousand to 25 thousand and 2,500 to 10 thousand.

The most prominent pattern is that of the distribution of the urbanized areas. The evenness of distribution of rural population in the middle west, the concentrations in the oases of the intermountain areas and the linear pattern of rural population in the Appalachian valleys are also very noticeable.

HAROLD M. MAYER

The University of Chicago

Demetri B. Shimkin. **Minerals: A Key to Soviet Power.** Harvard University Press, Cambridge, Massachusetts, 1953. 452 pages, 8 maps, 101 tables, bibliography, index of place names and subject index. $8.00.

Reliable, impartial, up-to-date information on the Soviet Union is hard to come by. Teachers will be grateful for the appearance of an authoritative and reliable book on the mineral production and resources of the USSR. Dr. Shimkin of the Russian Research Center at Harvard University has scoured the literature on Soviet minerals and has extracted from it a vast amount of information, here usefully assembled, appraised and organized. At the beginning of the discussion of each mineral there is a summary, which often will suffice to answer a specific question. Following this are more detailed treatments of production, international trade, consumption, production in satellite areas and reserves of each mineral. Since so many different minerals are covered, the discussion of each is necessarily somewhat brief. Maps locate the deposits mentioned; the many tables provide a wealth of statistical data; and an extensive bibliography lists the numerous sources. This book is by far the most complete and the best general summary of Soviet minerals available. As such it is valuable alike either to the person interested in the world-wide distribution of minerals, who wishes to fill in his gap on the Soviet Union, or to the person interested in the Soviet Union who desires to learn about its minerals.

CHAUNCY D. HARRIS

University of Chicago

Putnam, Donald F., editor, **Canadian Regions, A Geography of Canada.** J. M. Dent and Sons (Canada), Ltd., Toronto, 1952.

Students of North American geography will welcome this textbook, a collaboration by four of Canada's ablest geographers, Donald F. Putnam (editor), Benoit Brouillette, Donald P. Kerr and J. Lewis Robinson.

A traditional organization has been employed, with an introductory chapter on physical backgrounds. The bulk of the volume, encompassing 21 chapters, describes

the eight geographic regions identified by the authors: Newfoundland and Labrador, Maritime Provinces, Quebec, Southern Ontario, Northern Ontario, Prairie Provinces, British Columbia and the Canadian Northland. National production, commerce and national problems are reviewed in three final chapters.

Regions of Canada is a commendable, if encyclopedic, sourcebook, illustrated with numerous maps and photographs. Some, but unfortunately not all, of the authors utilize late statistics, while the large font fosters reading ease. Chapters are concluded with selected references; too few, unfortunately, will be locally available to geographers in the United States.

Several criticisms seem valid. The geographic regions are delineated primarily upon political bases; the editor might have more judiciously accepted the divisions employed by one of his authors, J. Lewis Robinson, in a high school text (*The Geography of Canada*, Longmans, Green and Co., Toronto, 1950). Phlegmatic style and unimaginative organization within the regional chapters are unfortunate; there is more "colour" than in most British geographies. The employment of so many chapter subheadings becomes burdensome; this was commendably avoided in chapter 22, *The Canadian Northland*, which is the most readable portion of the book. Compression of regional description into eight chapters would have permitted more cohesion.

Information regarding power developments on the Saguenay, recent cultural changes along the rural St. Lawrence, petroleum and other minerals in the Prairie Provinces, the port of Churchill and British Columbia agriculture indicate topics whose treatment seems adequate. By contrast, discussion of recent problems of Annapolis-Cornwallis apple growers, the Prince Edward Island fox farming decline, the southward migration of Canadians into New Brunswick, late developments in the Clay Belt, tourist trade on the Shield east of Georgian Bay, the Kitimat aluminum project and the Trans-Canada Highway seems insufficient. However, when one realizes that Canada's first university-level geography department was not established until 1935, one is impressed by the recent research by Canadian geographers which this book represents.

DAVID W. LANTIS

Los Angeles City College

Henry Chapin and F. G. Walton Smith. **The Ocean River.** Charles Scribner's Sons, New York, 1952. ix and 325 pages, with maps and diagrams. $3.50.

For more than a century the Gulf Stream has received attention by an interested public ranging from practical sailors plying the Atlantic to the scientists in their "ivory towers." Numerous articles have been published, some claiming the Gulf Stream as a giver of life, others asserting that its influence belongs in the category of myths. The book under review is a sane presentation and deals in most interesting fashion with the historical aspects, the scientific interpretation of causes and effects, and points out vividly the human relations of outstanding importance.

The content of the book embraces 14 chapters carrying such appealing titles as Oceanus, River of Life, Charting the River, The Treasure Revealed, The Codfish Frontier and closing with the final chapter on The Atlantic and Western Man. The early chapters present a résumé of legend and historical facts of interest to those who wish more light on the early concepts of the Gulf Stream. The middle chapters trace the course of the ocean river thruout the North Atlantic and thus lead the reader to an appreciation of all the major currents, their causes and their effects upon life and weather. The treatment is popularly presented and appears fundamentally sound without becoming unduly entangled with the mechanics involved.

The latter part of the book is an example of the human geography of the Ocean

River and clarifies the relationships to the bordering continents as well as to the industries directly connected with the sea. In this connection much emphasis is placed upon the future of the ocean as a great storehouse of resources that science has hardly begun to utilize. With the rapidly expanding population of the earth these resources can well afford hope of providing needed supplies of food, minerals and industrial raw materials for the future.

On the whole *The Ocean River* is a book worthy of attention not only by geographers but by all who seek to learn more about the ocean and its function in an expanding economy.

NELS A. BENGTSON

University of Nebraska

G. H. Dury, **Map Interpretation.** Sir Isaac Pitman & Sons, Ltd., London, 1952. xi and 203 pages. 22 illustrations and index. ($3.25 from The British Book Center, 122 East 55th Street, N.Y.)

This book presents the principles of map interpretation, with examples drawn primarily from the British Isles. A background of elementary map reading, physical geography, geomorphology and elementary geology is presumed. Nine of the 15 chapters deal with physical features, including scarpland topography, eroded folds, unglaciated uplands, glaciated highlands, karst topography, coasts and shorelines, arid landscapes and complex landscapes based upon complex structure. Cultural features receive less extensive treatment. Four chapters are devoted to occupance features: one to general land use and preliminary "principles," and one each to rural settlements, towns and features of prehistoric occupance. Chapter 15 is devoted to "Morphometric Analysis," the cartographic measurement of landforms. The author's colleague, Dr. H. C. Brookfield, contributed the final chapter on cartographical appreciation. Dr. A. E. Moody wrote the Foreword.

Analysis of a set of 15 topographic maps is integrated with the text, and the reader is urged to supplement both text and map study with field study. Most of the maps are British Ordnance Survey sheets, on scales of 1:63,360 and 1:25,000. The Casa Grande, Arizona, quadrangle (1:62,500) by the U. S. Geological Survey is included in the set. One sheet from the Netherlands and one from Germany (both 1:25,000) illustrate cartographic appreciation. Without the reference maps the book is sparsely illustrated. Eight photographs illustrate landscape features; more would enhance the value of the book. Text analysis of the set of topographic maps would make it difficult to substitute local maps and field areas in the United States. The book is therefore not well adapted to use as a text for map interpretation courses in American colleges. The basic treatment is excellent, however, and the book makes a valuable contribution to the literature. College teachers and advanced students will find it very worthwhile, both as an aid in map interpretation and for its intimate analysis of landscapes in the British Isles.

JAMES E. COLLIER

University of Missouri

Geography in the Primary School. Report prepared by a Joint Committee of the Training Colleges and Primary Groups. Published by the Geographical Association, Duke Street, Sheffield 2, England. Second Edition, 1953. Price 2/-post free

The report begins with a survey of the growth of the new outlook in the teaching of geography in the schools of Great Britain. It considers the characteristics of teaching

methods, present day conditions of geography teaching, results of recent surveys and geography work in the Primary School, its purposes and characteristics. This section considers the work with children in two age groups, namely from 7 to 9 and 9 to 11 years of age.

The study proceeds to the work of geography in the Junior School, where the local units are considered as the core of the curriculum. The nature of these core studies is presented and suggestions for the extensions of the concepts into the larger units is developed. Examples of these ideas and the method by which they can be accomplished are given.

The last section in the study deals with the methods of teaching these various units.

The appendix includes a list of textbooks, air photographs and Ordnance Survey Maps useful in the teaching of geography.

INA CULLOM ROBERTSON

State Teachers College
Valley City, North Dakota

H. W:son Ahlmann. **Glacier Variations and Climatic Fluctuations.** Bowman Memorial Lectures. The American Geographical Society, New York, 1953. v and 51 pages with iv plates. **$2.50.**

Glacier Variations and Climatic Fluctuations is the third in a series of the Isaiah Bowman Memorial Fund lectures. Series I was entitled *Geography, Justice and Politics at the Paris Conference of 1919*, by Charles Seymour (1951), and Series II, *Agricultural Origins and Dispersals* by Carl O. Sauer appeared in 1952 a year later.

Professor Ahlmann's lecture was the principal address at the meeting of the Seventeenth International Geographical Congress held in Washington, D.C., in August of 1950. Readers who heard the lecture will be happy to note that the original text has been enlarged for publication. Additional data and references have been added to make the work more complete. To specialists in all fields interested in glaciation this book is indispensable. After reviewing the factors influencing glacier variations and analyzing the pronounced glacier recession of recent decades, he supplies seven pages of reference material.

BOOKS AND PAMPHLETS RECEIVED

Annemarie Elisabeth Krause. **Mennonite Settlement in the Paraguayan Chaco.** (Doctorate Dissertation) Chicago, December, 1952. xiii and 143 pages with illustrations and diagrams.

Curriculum Bulletin. "Southeast Asia: World Neighbors." University of Oregon, Eugene, 1953. Vol. IX, No. 122. 30 pages. $.50.

Curiculum Bulletin. "Weather and the Weatherman." University of Oregon, Eugene, 1953. Vol. IX, No. 125. 23 pages. $.40.

Benoît Brouillette. **The Province of Quebec.** J. M. Dent and Sons, Toronto, 1953. (Reprint from **Canadian Regions,** pages 123-212) 43 maps and 18 photographic plates.

Nancy Jean Wilcox. **Educational Travel Courses for Teachers.** F. A. Owen Publishing Company, Dansville, New York, 1953. ix and 40 pages with illustrations and charts.

Felice Benuzzi. **No Picnic on Mount Kenya.** E. P. Dutton and Co., New York, 1953. viii and 239 pages with diagrams. $3.75.

W. H. Murray. **The Story of Everest 1921-1952.** E. P. Dutton and Co., New York, 1953. ix and 193 pages with photographs, diagrams and index. $3.75.

Stuart A. Queen and David B. Carpenter. **The American City.** McGraw-Hill Book Co., New York, 1953. viii and 383 with maps, tables, illustrations and indices. $5.50.

Earl Lackey and Esther Anderson. **Regions and Nations of the World.** Second Edition. D. Van Nostrand Company, New York, 1953. xix and 489 pages with maps, tables and illustrations. $5.75.

Social Science Frontiers, Vol. 49. Annual Proceedings of the Middle States Council for the Social Studies. Harry S. Scott, Inc., Baltimore 2, 1953.

Staats and Harding. **Elements of World Geography,** Second Edition. D. Van Nostrand Co., New York, 1952.

G. H. Dury. **Map Interpretation.** British Book Centre, Inc., New York, 1952. xi and 203 pages with illustrations and index. $3.25.

Edward Lynam. **The Mapmaker's Art.** British Book Centre, Inc., New York, 1953. ix and 140 pages with illustrations and index. $4.50.

Hammond's **Modern World Atlas and Gazetteer,** C. S. Hammond, New York, 1952. 48 pages of maps.

Gertrude Brown. **Your Country and Mine.** Ginn and Company, Chicago, 1951. 488 pages with illustrations, maps and index.

Josephine Mackenzie. **Your People and Mine.** Ginn and Company, Chicago, 1949. 318 pages with illustrations, maps and index.

Philip Street. **Between the Tides.** Philosophical Library, New York, 1953. 175 pages with illustrations and index. $4.75.

Eric Shipton. **The Mount Everest Reconnaissance Expedition.** E. P. Dutton Co., New York, 1953. 128 pages with maps and illustrations. $6.00.

Rand McNally **Classroom Atlas.** Rand McNally, Chicago, 1950. 64 pages of maps.

Alison E. Aitchison. **Protecting Our Forest Wealth.** Iowa State Teachers College, 1952. 24 pages with illustrations. $.25.

L. Dudley Stamp and G. H. T. Kimble. **The World A General Geography,** Second Edition. Longmans, Green and Co., New York, 1953. 711 pages with maps and index. $3.25.

Muriel Sibell Wolle. **The Bonanza Trail.** Indiana University Press, Bloomington, 1953. xvi and 510 pages with illustrations, glossary, bibliography and index. $8.50.

R. W. Eschmeyer. **Woody Woodcock, Al Alligator, Mac Mallard, Willie Whitetail, Bob White, Charley Cottontail, Bobby Bluegill, Freddy Fox Squirrel, Tommy Trout, Billy Bass.** Fisherman Press, Oxford, Ohio, 1953. 50 pages with illustrations in each book. Paper-bound, $.50, Cloth, $1.00.